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L3	433	configurator	USPAT	OR	ON	2005/02/15 12:08
L4	11	configurator and fieldbus	USPAT	OR	ON	2005/02/15 12:08
L5	2	("6449715").URPN.	USPAT	OR	ON	2005/02/15 12:11
L6	2	fieldbus same validat\$5	USPAT	OR	ON	2005/02/15 12:12
L7	25	(fieldbus or hart or devicenet or modbus or controlnet or worldfip) same validat\$6	US-PGPUB; USPAT	OR	ON	2005/02/15 12:14
L8	336	(fieldbus or hart or devicenet or modbus or controlnet or worldfip) same configurat\$6	US-PGPUB; USPAT	OR	ON	2005/02/15 12:14
L9	14	(fieldbus or hart or devicenet or modbus or controlnet or worldfip) same configurat\$6 same (validat\$5 or accept\$5)	US-PGPUB; USPAT	OR	ON	2005/02/15 12:16
L10	9	(fieldbus or hart or devicenet or modbus or controlnet or worldfip) same configurat\$6 same simulat\$6	US-PGPUB; USPAT	OR	ON	2005/02/15 12:30
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L12	1	"6823280"	US-PGPUB; USPAT	OR	ON	2005/02/15 12:34
L13	1	"20040064253".did.	US-PGPUB; USPAT	OR	ON	2005/02/15 12:59
L14	3	fieldbus same validation	US-PGPUB; USPAT	OR	ON	2005/02/15 12:59
L15	1887	configurat\$5 same validation	US-PGPUB; USPAT	OR	ON	2005/02/15 12:59
L16	28	configurat\$5 same validation same simulat\$5	US-PGPUB; USPAT	OR	ON	2005/02/15 12:59
L17	0	("6823280").URPN.	USPAT	OR	ON	2005/02/15 13:02
L18	14	("3237318"   "4070705"   "4340935"   "4455614"   "4512747"   "4692298"   "4783307"   "4941113"   "5079731"   "5142469"   "5386459"   "5889942"   "6618856").PN.	US-PGPUB; USPAT; USOCR	OR	ON	2005/02/15 13:05
L19	6	("5276811" "6442441" "6446202" "6449715" "6556950" "6618856").PN.	US-PGPUB; USPAT; USOCR	OR	ON	2005/02/15 13:08

L20	5	(verif\$5 same validat\$5 same plc)	US-PGPUB; USPAT; USOCR	OR	ON	2005/02/15 13:10
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L24	200020	(verif\$5 or validat\$5 same (plc or daq or controller))	US-PGPUB; USPAT; USOCR	OR	ON	2005/02/15 13:11
L25	13673	((verif\$5 or validat\$5) same (plc or daq or controller))	US-PGPUB; USPAT; USOCR	OR	ON	2005/02/15 13:11
L26	372	(verif\$5 or validat\$5) same (plc or daq)	US-PGPUB; USPAT; USOCR	OR	ON	2005/02/15 13:12
L27	33	(verif\$5 or validat\$5) same (plc or daq) same (config\$6)	US-PGPUB; USPAT; USOCR	OR	ON	2005/02/15 13:15
L28	265	(verif\$5 or validat\$5) same (config\$6) same simulat\$5	US-PGPUB; USPAT; USOCR	OR	ON	2005/02/15 13:15



US006141596A

**United States Patent** [19]

Gretta et al.

[11] **Patent Number:** **6,141,596**[45] **Date of Patent:** **\*Oct. 31, 2000**

[54] **FIELDBUS NETWORK CONFIGURATION  
UTILITY WITH IMPROVED SCHEDULING  
AND LOOPING**

5,971,581 10/1999 Gretta et al. .... 700/83

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*Primary Examiner*—William Grant

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[73] **Assignee:** National Instruments Corporation,  
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[\*] **Notice:** This patent is subject to a terminal disclaimer.

[21] **Appl. No.:** 09/349,682

[22] **Filed:** Jul. 8, 1999

**Related U.S. Application Data**

[62] Division of application No. 08/932,356, Sep. 17, 1997, Pat. No. 5,971,581.

[51] **Int. Cl.**<sup>7</sup> ..... G05B 15/00

[52] **U.S. Cl.** ..... 700/83; 700/7; 700/4;  
700/9; 700/34; 700/37; 700/67; 700/79

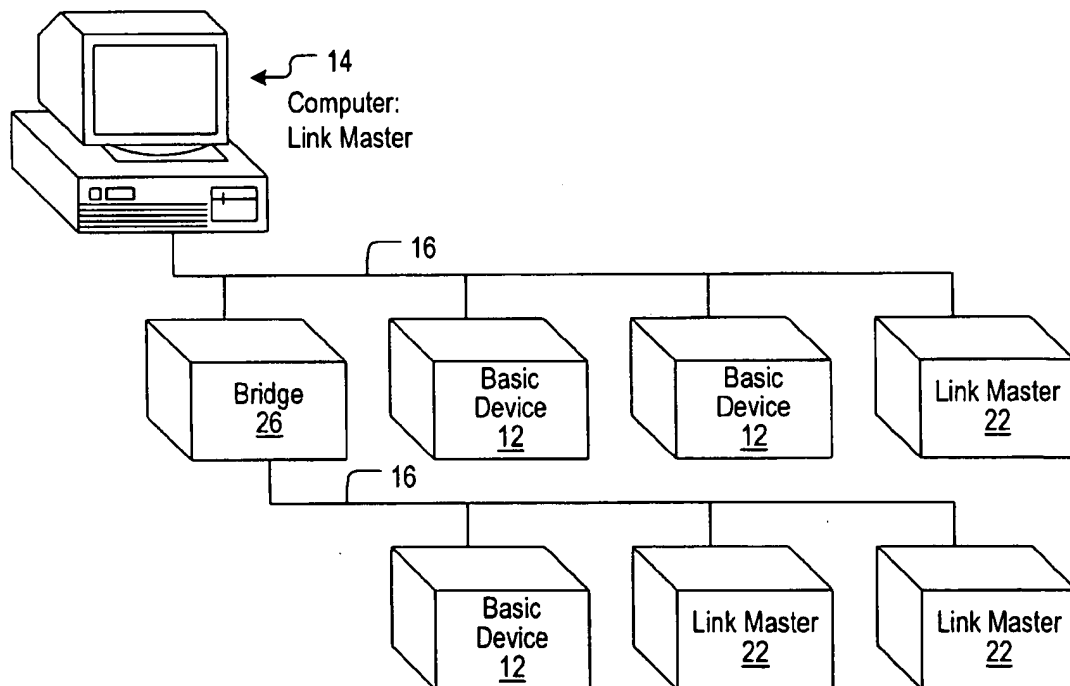
[58] **Field of Search** ..... 700/83, 2, 4, 37,  
700/67, 79; 70/9, 34

[56] **References Cited****U.S. PATENT DOCUMENTS**

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[57] **ABSTRACT**

A system and method for creating a fieldbus configuration on a computer system. The user assembles a graphical program or wiring diagram on the screen which comprises a selected plurality of function block icons which are linked with one or more wires connecting the function block icons. As the user assembles the fieldbus configuration wiring diagram, the system automatically creates and displays a schedule which visually presents the schedule being created. The schedule comprises one or more schedule bars for graphically or visually indicating the order of execution of the function blocks. The user can change the order of execution indicated by the schedule by graphically manipulating the schedule bars in the schedule. The user can also place one or more loop structures in the editor window which encapsulate a group of function block icons. The loop structure is used to specify a rate for the function block icons comprised within the loop structure.

**52 Claims, 48 Drawing Sheets****Fieldbus Network Devices**



US006076952A

**United States Patent** [19][11] **Patent Number:** **6,076,952****Gretta et al.**[45] **Date of Patent:** **Jun. 20, 2000**[54] **FIELDBUS NETWORK CONFIGURATION  
UTILITY WITH IMPROVED PARAMETER  
CONTROL**[75] **Inventors:** **Robert Gretta; Ram Ramachandran,**  
both of Austin, Tex.[73] **Assignee:** **National Instruments, Corp., Austin,**  
Tex.[21] **Appl. No.:** **08/932,274**[22] **Filed:** **Sep. 17, 1997**[51] **Int. Cl.<sup>7</sup>** ..... **G05B 9/02**[52] **U.S. Cl.** ..... **364/188; 709/220; 370/248;**  
**370/252; 370/255; 370/254; 370/257; 370/258;**  
**370/457; 370/351**[58] **Field of Search** ..... **364/188; 370/254,**  
**370/351, 248, 257, 258, 255, 457, 252;**  
**709/220**[56] **References Cited****U.S. PATENT DOCUMENTS**

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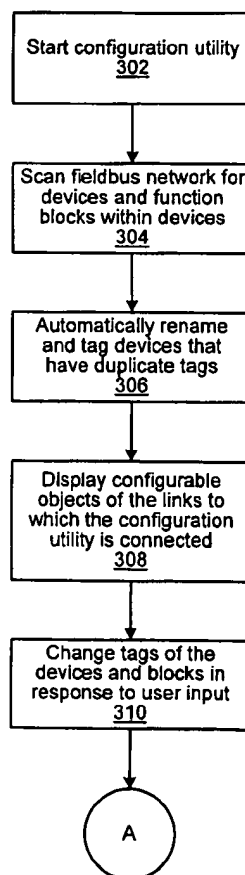
*Primary Examiner*—Paul P. Gordon

*Assistant Examiner*—McDjeunel Marc

*Attorney, Agent, or Firm*—Conley, Rose & Tayon; Jeffrey C. Hood

[57] **ABSTRACT**

A system and method for displaying and configuring parameters in a fieldbus configuration system. The fieldbus configuration utility first determines the devices and blocks present in the system, and then determines the parameters of each block. When the parameters are displayed, an object is displayed proximate to certain of the parameters. The object includes a color and/or shape which indicates the type or class of parameter. The user can also configure alarms and trends using the improved graphical interface of the present invention. The user configures alarms and trends by assembling a graphical program or wiring diagram on the screen which comprises a selected one or more block icons and an icon representing the device receiving the trend or alarm. The system also includes a periodic update window which is used to obtain periodically updated values of selected parameters.

**58 Claims, 48 Drawing Sheets**

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L1	29	fieldbus same component same configur\$5	US-PGPUB; USPAT	OR	ON	2005/02/15 12:00
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L6	2	fieldbus same validat\$5	USPAT	OR	ON	2005/02/15 12:12
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L8	336	(fieldbus or hart or devicenet or modbus or controlnet or worldfip) same configurat\$6	US-PGPUB; USPAT	OR	ON	2005/02/15 12:14
L9	14	(fieldbus or hart or devicenet or modbus or controlnet or worldfip) same configurat\$6 same (validat\$5 or accept\$5)	US-PGPUB; USPAT	OR	ON	2005/02/15 12:16
L10	9	(fieldbus or hart or devicenet or modbus or controlnet or worldfip) same configurat\$6 same simulat\$6	US-PGPUB; USPAT	OR	ON	2005/02/15 12:30
L11	1	"20030061274".did.	US-PGPUB; USPAT	OR	ON	2005/02/15 12:33
L12	1	"6823280"	US-PGPUB; USPAT	OR	ON	2005/02/15 12:34
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L14	3	fieldbus same validation	US-PGPUB; USPAT	OR	ON	2005/02/15 12:59
L15	1887	configurat\$5 same validation	US-PGPUB; USPAT	OR	ON	2005/02/15 12:59
L16	28	configurat\$5 same validation same simulat\$5	US-PGPUB; USPAT	OR	ON	2005/02/15 12:59
L17	0	("6823280").URPN.	USPAT	OR	ON	2005/02/15 13:02
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L25	13673	((verif\$5 or validat\$5) same (plc or daq or controller))	US-PGPUB; USPAT; USOCR	OR	ON	2005/02/15 13:11
L26	372	(verif\$5 or validat\$5) same (plc or daq)	US-PGPUB; USPAT; USOCR	OR	ON	2005/02/15 13:12
L27	33	(verif\$5 or validat\$5) same (plc or daq) same (config\$6)	US-PGPUB; USPAT; USOCR	OR	ON	2005/02/15 13:15
L28	265	(verif\$5 or validat\$5) same (config\$6) same simulat\$5	US-PGPUB; USPAT; USOCR	OR	ON	2005/02/15 13:25
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L30	80	(verif\$5 or validat\$) and 29	US-PGPUB; USPAT	OR	ON	2005/02/15 13:45
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